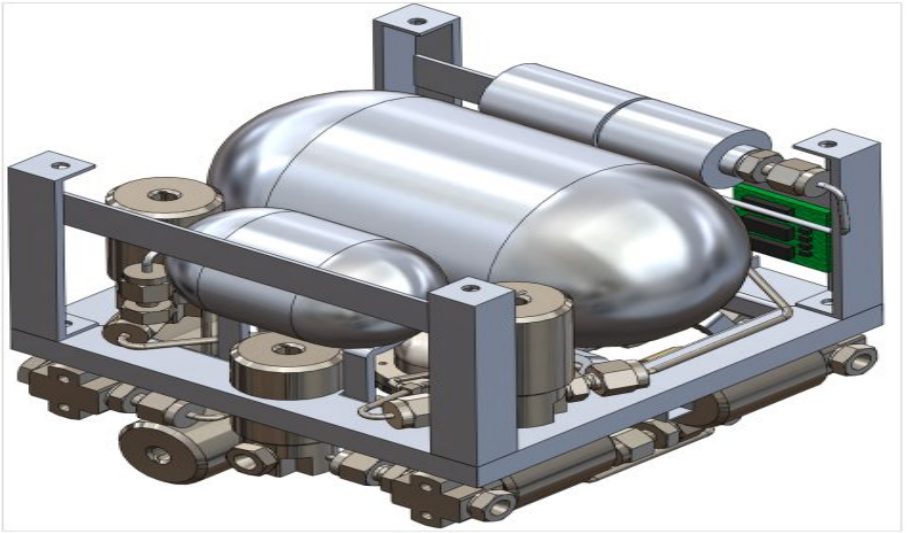
NASA SBIR/STTR Technologies

S3.02-9823 - Miniature Nontoxic Nitrous Oxide-Propane (MINNOP) Propulsion

PI: Christopher St. Clair
Orbital Technologies Corporation - Madison, WI

Identification and Significance of Innovation

ORBITEC proposes to develop the Miniature Nontoxic Nitrous Oxide-Propane (MINNOP) propulsion system, a small bipropellant propulsion system which we offer as an alternative to miniature hydrazine monopropellant thrusters for CubeSat-class spacecraft. As compared to state-of-the-art hydrazine systems, MINNOP propulsion will provide significant increases in specific impulse (in bipropellant mode) and comparable levels of minimum impulse bit (in cold gas mode), and it will do so with a nontoxic, environmentally benign, self-pressurizing set of propellants. Our preliminary propulsion system design is intended to occupy 1U of a 3U-size CubeSat.



Estimated TRL at beginning and end of contract: (Begin: 2 End: 4)

Technical Objectives and Work Plan

The Phase I work has two key technical objectives: demonstrating operation of a bipropellant nitrous oxide-propane thrust chamber at an appropriate thrust level, and demonstrating ignition of these gaseous propellants with an ignition suitable for use on a miniature spaceflight propulsion system. These two objectives are selected to directly address what we judge to be the key technical risks with the MINNOP system. Our Phase I work plan is structured to meet those objectives, including defining specifications for the Phase I test hardware, preparing the test facility for MINNOP testing, designing and building both the Phase I bipropellant thrust chamber and Phase I ignition test hardware, performing hot-fire tests with both sets of hardware, and evaluating the results. The overall goal of the Phase I work is to establish the feasibility of the MINNOP propulsion concept.

NASA Applications

The MINNOP propulsion system will be an attractive replacement for both hydrazine monopropellant systems and, at larger scales, MMH-NTO bipropellant systems, providing a nontoxic propellant alternative which will simplify development work and ground operations. Potential applications for these systems range widely from CubeSat applications in LEO to larger systems for orbital insertion and planetary maneuvering.

Non-NASA Applications

The MINNOP propulsion system will be directly applicable to DoD and commercial spacecraft also; all will benefit from the safety and performance advantages provided by shifting away from hydrazine.

Firm Contacts

Eric Rice
Orbital Technologies Corporation
Space Center, 1212 Fourier Drive
Madison, WI, 53717-1961
PHONE: (608) 827-5000
FAX: (608) 827-5050